

High Resolution Element-Selective Microscopy Using X-ray Enhanced Scanning Tunneling Microscopy

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Nanoscale structures are at the forefront of fundamental research as well as the keystone for whole new classes of potential applications. Proper understanding of these systems requires tools that can resolve the nm scale with detailed information about the electronic and magnetic structure. The scanning tunneling microscope (STM) can be a major contributor due to the ability to achieve atomic resolution. The tunneling process though does not easily provide direct determination with an elemental selectivity hence a tool that could do so with nm spatial resolution would make tremendous impact on these problems as well as many others. X-rays probes provide elemental selectivity of electronic and magnetic properties, but currently lack the ability to achieve spatial resolutions below 10 nm. Here we propose a radically different idea that will use a scanning tunneling microscope (STM) as a local detector of x-ray absorption. Merging these two techniques offers the potential to probe element-resolved details with nm scale spatial resolution. Such a tool would have a profound impact in many areas of nanoscience and nanotechnology.